**1. COURSE TITLE\*:** Introductory Statistics

**2**. **CATALOG – PREFIX/COURSE NUMBER/COURSE SECTION\*: MATH 2281**

**3. PREREQUISITES\*:**

A student must meet **ONE** of the following criteria to register for this course:

- Finite Math 1124 or College Algebra 1141

- MATH 2238

- A grade of C or higher in either MATH 1118 or MATH 1125

- Three High school STEM or Core Math courses with grades of B or higher

- ACT Math Score of 22 or higher

 - SAT Math Score of 530 or higher

 - Accuplacer QAS score of 263 or higher

**COREQUISITE(S)\*: None**

**4. COURSE TIME/LOCATION/MODALITY: (*Course Syllabus – Individual Instructor Specific*)**

**5. CREDIT HOURS\*:** 4 **LECTURE HOURS\*:** 4

 **LABORATORY HOURS\*:** 0 **OBSERVATION HOURS\*: 0**

**6. FACULTY CONTACT INFORMATION: *(Course Syllabus – Individual Instructor Specific)***

**7. COURSE DESCRIPTION\*:**

This course is designed for students needing a non-calculus based introduction to statistics. It covers sampling methods, experimental design, descriptive analysis and presentation of data, probability, binomial and normal distributions, the Central Limit Theorem, confidence intervals, hypothesis tests for means and proportions, linear correlation and regression, and chi-square tests.

**8. LEARNING OUTCOMES\*:**

At the completion of this course the student will be able to:

1. Summarize univariate and bivariate data using graphical, tabular, and numerical methods and describe the attributes of or relationships between the data.
2. Identify the characteristics of a well-designed statistical study and critically evaluate various aspects of a study.
3. Recognize the limitations of observational studies and common sources of bias in surveys and experiments.
4. Recognize that association is not causation.
5. Compute the probability of compound events, independent events, disjoint events, and conditional events.
6. Compute probabilities using discrete and continuous distributions.
7. Explain the difference between statistics and parameters.
8. Describe sampling distributions and generate sampling distributions to observe the Central Limit Theorem.
9. Estimate population parameters using point and interval estimates and interpret the interval in the context of the problem.
10. Summarize the relationship between the confidence level, margin of error, and sample size.
11. Formulate null and alternative hypotheses given a research question.
12. Describe the logic and framework of the inference of hypothesis testing.
13. Make decisions using the p-value and draw appropriate conclusions.
14. Interpret statistical significance and recognize that statistical significance does not necessarily imply practical significance.
15. Perform hypothesis tests with quantitative variables and qualitative variables.
16. Interpret statistical results in context when statistical information is presented in news stories and journal articles.

**9. ADOPTED TEXT\*:**

Introductory Statistics 2e

 OpenStax - Open Resource Textbook

Download for free at

<https://openstax.org/books/introductory-statistics-2e/pages/1-introduction>

 Barbara Illowsky, Susan Dean

**9a: SUPPLEMENTAL TEXTS APPROVED BY FULL TIME DEPARTMENTAL FACULTY (INSTRUCTOR MUST NOTIFY THE BOOKSTORE BEFORE THE TEXTBOOK ORDERING DEADLINE DATE PRIOR TO ADOPTION) \*\*\*.**

**10. OTHER REQUIRED MATERIALS: (SEE APPENDIX C FOR TECHNOLOGY REQUEST FORM.)\*\***

Technology will be used (calculators, computer packages, or web application software) to minimize involved computations. Excel Spreadsheets are provided.

A scientific calculator is required; one that is also statistics capable is recommended. The book gives step by step instructions on how to use the TI 83, TI 83+, TI 84, and TI 84+ calculators. Some sections of this course use a free statistics calculator, so please speak with your instructor prior to purchasing a calculator with statistics capabilities.

 **11. GRADING SCALE\*\*\*:**

Grading will follow the policy in the catalog. The scale is as follows:

A: 90 – 100

 B: 80 – 89

 C: 70 – 79

 D: 60 – 69

 F: 0 – 59

**12. GRADING PROCEDURES OR ASSESSMENTS: (*Course Syllabus – Individual Instructor Specific)***

|  |
| --- |
| *Example 1*  |
| *Category* | *By Total Points* | *% of Grade* |
| Homework (20x10) | 200 | 10% |
| Quizzes/Tests(5x360) | 1800 | 90% |
| Total | 2000 | 100% |

|  |
| --- |
| *Example 2* |
| *Category* | *By Total Points* | *% of Grade* |
| Online Quizzes | 400 | 100% |
| Online Tests(6x100) | 600 | 15% |
| Notebook(2x500) | 1000 | 25% |
| Midterm | 1000 | 25% |
| Final | 1000 | 25% |
| Total | 4000 | 100% |

**13. COURSE METHODOLOGY: *(Course Syllabus – Individual Instructor Specific)***

The course design provides instruction and materials to support the course objectives. Classes may consist of a variety of means to accomplish this including but not limiting to: lectures, class discussions, small group projects, supplemental materials, and outside assignments. Practice is an important part of the learning process. For every one hour of class time, two to three additional hours of study time should be expected.

 **14. COURSE OUTLINE: *(Course Syllabus – Individual Instructor Specific)***

**Chapter 1. Sampling and Data**  **–** **LO1, LO2, LO3, LO4, LO7, LO16**

1.1. Definitions of Statistics, Probability, and Key Terms

1.2. Data, Sampling, and Variation in Data and Sampling

1.3. Frequency, Frequency Tables, and Levels of Measurement

1.4. Experimental Design and Ethics

Stats Lab\*

Note: In section 1.4, discuss the differences between observational studies and experiments and emphasize the limitations of observational studies.

**Chapter 2. Descriptive Statistics** – **LO1, LO7**

2.1. Stem-and-Leaf Graphs (Stemplots), Line Graphs, and Bar Graphs

2.2. Histograms, Frequency Polygons, and Time Series Graphs

2.3. Measures of the Location of the Data

2.4. Box Plots

2.5. Measures of the Center of the Data

2.6. Skewness and the Mean, Median, and Mode

2.7. Measures of the Spread of the Data

Stats Lab\*

**Chapter 3. Probability Topics – LO5**

3.1. Terminology

3.2. Independent and Mutually Exclusive Events

3.3. Two Basic Rules of Probability

3.4. Contingency Tables

3.5. Tree and Venn Diagrams

Stats Lab\*

**Chapter 4. Discrete Random Variables – LO6**

4.1. Probability Distribution Function (PDF) for a Discrete Random Variable

4.2. Mean or Expected Value and Standard Deviation

4.3. Binomial Distribution

Stats Lab\*

**Chapter 5. Continuous Random Variables – LO6**

5.1. Continuous Probability Functions

5.2. The Uniform Distribution (optional)

**Chapter 6. The Normal Distribution – LO6**

6.1. The Standard Normal Distribution

6.2. Using the Normal Distribution

Stats Lab\*

**Chapter 7. The Central Limit Theorem – LO8**

7.1. The Central Limit Theorem for Sample Means

7.2 The Central Limit Theorem for Sums

7.3. Using the Central Limit Theorem

Stats Lab\*

**Chapter 8. Confidence Intervals – LO9, LO10**

8.1. A Single Population Mean using the Normal Distribution

8.2. A Single Population Mean using the Student's t-Distribution

8.3. A Population Proportion

Stats Lab\*

**Chapter 9. Hypothesis Testing with One Sample – LO11, LO12, LO13, LO14, LO15, LO16**

9.1. Null and Alternative Hypotheses

9.2. Outcomes and the Type I and Type II Errors

9.3. Distribution Needed for Hypothesis Testing

9.4. Rare Events, the Sample, Decision and Conclusion

9.5. Additional Information and Full Hypothesis Test Examples

Stats Lab\*

**Chapter 10. Hypothesis Testing with Two Samples – LO11, LO12, LO13, LO14, LO15, LO16**

10.1. Two Population Means with Unknown Standard Deviations

10.2. Two Population Means with Known Standard Deviations (optional)

10.3. Comparing Two Independent Population Proportions

10.4. Matched or Paired Samples

Stats Lab\*

**Chapter 11. The Chi-Square Distribution – LO11, LO12, LO13, LO14, LO15**

11.1. Facts About the Chi-Square Distribution

11.2. Goodness-of-Fit Test

11.3. Test of Independence

11.4. Test for Homogeneity (optional)

11.5. Comparison of the Chi-Square Tests (optional)

Stats Lab\* (optional)

**Chapter 12. Linear Regression and Correlation – LO1, LO15**

12.1. Linear Equations

12.2. Scatter Plots

12.3. The Regression Equation

12.4. Testing the Significance of the Correlation Coefficient

12.5. Prediction

12.6. Outliers

Stats Lab\*

**Chapter 13. F Distribution and One-Way ANOVA – LO15**

13.1. One-Way ANOVA (optional)

13.2. The F Distribution and the F-Ratio (optional)

13.3. The Regression Equation (optional)

13.4. Testing the Significance of the Correlation Coefficient (optional)

Stats Lab\* (optional)

\*The Stat Lab sections at the end of the chapters may be substituted with another activity that promotes active learning or critical thinking.

**Recommended course outline:**

 Week 1: Chapter 1

 Week 2: Chapter 2

 Week 3: Chapter 2

 Week 4: Chapter 3

 Week 5: Chapter 4

 Week 6: Chapter 5, Chapter 6

 Week 7: Chapter 7

 Week 8: Chapter 8

 Week 9: Chapter 8

 Week 10: Chapter 9

 Week 11: Chapter 9

 Week 12: Chapter 10

 Week 13: Chapter 11

 Week 14: Chapter 12

 Week 15: Chapter 12

**15. SPECIFIC MANAGEMENT REQUIREMENTS\*\*\*:**

**16. FERPA: \***

Students need to understand that their work may be seen by others. Others may see your work when being distributed, during group project work, or if it is chosen for demonstration purposes. Students also need to know that there is a strong possibility that your work may be submitted to other entities for the purpose of plagiarism checks.

**17.** **ACCOMMODATIONS: \***

Students requesting accommodations may contact Ryan Hall, Accessibility Coordinator at rhall21@sscc.edu or 937-393-3431 X 2604.

Students seeking a religious accommodation for absences permitted under Ohio’s Testing Your Faith Act must provide the instructor and the Academic Affairs office with written notice of the specific dates for which the student requires accommodation and must do so no later than fourteen (14) days after the first day of instruction or fourteen (14) days before the dates of absence, whichever comes first. For more information about Religious Accommodations, contact Ryan Hall, Accessibility Coordinator at rhall21@sscc.edu or 937-393-3431 X 2604.

**18. OTHER INFORMATION\*\*\*:**

**SYLLABUS TEMPLATE KEY**

**\*** Item cannot be altered from that which is included in the master syllabus approved by the Curriculum Committee.

**\*\*** Any alteration or addition must be approved by the Curriculum Committee

**\*\*\*** Item should begin with language as approved in the master syllabus but may be added to at the discretion of the faculty member.